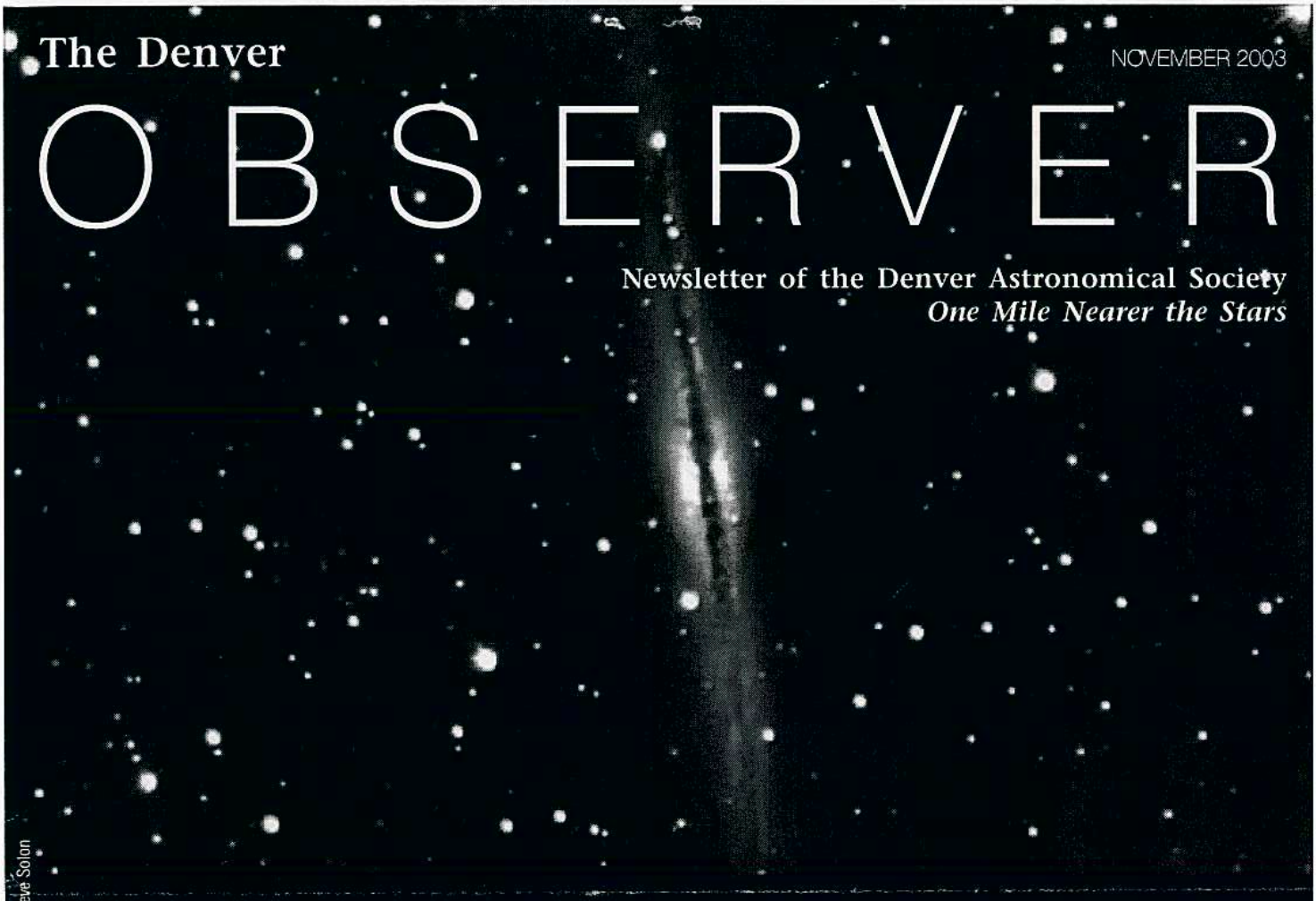
The Denver
NOVEMBER 2003
OBSERVER
Newsletter of the Denver Astronomical Society
One Mile Nearer the Stars



A Lovely Spiral

Edge-on spiral galaxy NGC 891 in Andromeda is thought to be about 23 million light years distant. Shot with a 12.5-inch f/9 Ritchey Cretien telescope on a Paramount ME, this is is a combination of 10 two-minute images taken on September 27, 2003. Be sure to read Steve's CCD imaging article on Page 4.

Double-Dipped Celestial Events

Inside The Observer

NOVEMBER SKIES 2003

Our moon is one busy body this month while acting as a key player in two eclipses. And, if a total lunar eclipse and total solar eclipse aren't enough for your celestial appetite, how about two peak dates for the Leonid meteor shower? While no one is predicting the meteor numbers we experienced in 1966 and 2001, Bill Cooke, Marshal Space Flight Center, thinks we "might have a nice display." Peak target dates are November 13 and 19. The first shower favors meteor watchers in Alaska, Hawaii, and along the Pacific rim of Asia, while the second (and more impressive) will give observers on the east coast of the US a better view. As for the eclipses, most of us won't be travelling to the south pole to watch the moon cover the sun, but the total lunar eclipse on the 8th will look great right here in our own neighborhood. Join fellow DAS members for a very special open house to celebrate the event. I hope your skies are clear and dark.—*Patti Kurtz*

8	Full moon, Total lunar eclipse (6:13 P.M.)
13,19	Leonid meteor shower peaks
16	Last quarter moon
23	New moon, Total solar eclipse visible from Antarctica
30	First quarter moon

PRESIDENT'S CORNER

Colorado Astronomy day was a tremendous success. I'd like to thank everyone who staffed the tables, brought solar scopes and helped keep the open house open. Patti Kurtz once again threw herself into the fray and organized an event that went off without a hitch. Maybe if we start now, we can convince her to make a return trip next year to organize the next Astronomy Day.

Also, thanks to those who organized the annual DAS auction. With their help we raised $414.50 for the Van Nattan Scholarship fund. The scholarship fund was established in 1973 by the DAS and honors the memories of William R. Van Nattan and Charles Hansen.

William R. Van Nattan was a founding member of the DAS and the National Amateur Astronomers (NAA). As chairman of the Denver Planetarium Committee in 1955, he was instrumental in providing a planetarium at the Denver Museum of Nature and Science. Thanks to John J. Merritt of Lakewood, Colorado, who dropped off a 16-inch Meade Starfinder—100% of proceeds will go to the DAS.

Colorado Astronomy Day
Visitors line up on the Sky Terrace at the Denver Museum of Nature & Science to look through the various solar scopes provided. DAS member Tim Pimentel sits by his scope in the foreground. See more photos on Page 7.

Image copyright 2003 Ron Pearson

Charles Hansen was also an avid supporter of astronomy. Upon his death he left a significant portion of his estate to the DAS for use in supporting the fund.

Their enthusiasm for astronomy continue to help others by providing scholarships to high school and undergraduate students of astronomy and related sciences. —*Carla Swartz*

DAS Schedule

NOVEMBER

7 E-Board meeting, 8 P.M.
8 ***Clean-up Day*** *(4:00 P.M.)* and ***Open House***—★ **Total Lunar Eclipse.**★ *(the Open House begins at 5:00P.M.)*
14 General Meeting at Olin Hall, DU, 7:30 P.M.—"Members Show-N-Tell."
22-23 Dark Sky Site Weekend
27 Thanksgiving

DECEMBER

5 E-Board meeting, 8 P.M.
6 Holiday Potluck, 5 P.M. (See Page 7.)
20 Hanukkah
20-21 Dark Sky Site Weekend
25 Christmas
27 Open House (begins at 5:00P.M.)—"How to Use Your New Telescope." (begins at 7:00 P.M.)

Public nights are held every Tuesday and Thursday evenings beginning at the following times: October 1 - March 31 at 7:00 P.M.
April 1 - September 30 at 8:30 P.M. at Chamberlin Observatory
Costs to non-members are: $3.00 adults, $2.00 children.
Please call (303) 281-9052 for reservations.

DAS Officers

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Ivan Geisler — David Shouldice
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The Observer *is available in color PDF format from the DAS website.*

The Executive Board conducts the business of the DAS at 8 P.M. at Chamberlin Observatory. Please see the Schedule of Events for meeting dates. All members are welcome.

www.denverastrosociety.org

NASA's Space Place

Hurricane Team Work

by
Dr. Tony Phillips

On a gray breezy day last month thousands of people got in their cars and reluctantly left home. U.S. east coast highways were thick with traffic. Schools were closed. Businesses shut down.

Perfect!

When powerful Hurricane Isabel arrived some 38 hours later nearly everyone in the storm's path had fled to safety.

Days later Vice Admiral Lautenbacher, in a briefing to President Bush, praised the National Atmospheric and Oceanic Administration (NOAA): "Without NOAA's excellent track forecasts, hurricane Isabel's toll on lives and property would have been even more devastating. This is NOAA's first year of providing 5-day forecasts-and the 5-day forecast for Isabel was as good as our 2-day forecasts have been over the last decade."

Many people in NOAA played a role. A team of pilots, for instance, flew Gulfstream-IV High Altitude Surveillance jets right up to the approaching hurricane, logging 25,000 miles in the days before landfall. Their jets deployed devices called dropsondes-little weather stations that fall toward the sea, measuring pressure, humidity, temperature and wind velocity as they plummet. The data were radioed back to the aircraft and transmitted to forecasters on shore.

While two Gulfstream-IV crews flew night and day around the storm, a NOAA satellite named GOES-EAST monitored Isabel from above. (GOES is short for Geostationary Operational Environmental Satellite.)

From an orbit 22,300 miles above the Atlantic Ocean, GOES-EAST had a unique view. "It could see the entire hurricane at once," says Ron Gird of NOAA. "Scientists used infrared spectrometers onboard the satellite to estimate the height of the storm clouds, their temperature and water content. GOES can also measure the temperature of the ocean surface-the source of power for hurricanes."

Constant streams of data from GOES and the Gulfstream aircraft were fed to supercomputers at NOAA's Environmental Modeling Center in Maryland where sophisticated programs, developed over the years by meteorologists and programmers, calculated the storm's most likely path.

Supercomputers. Satellites. Jet airplanes. Scientists. Programmers. Pilots. It took a big team using a lot of tools to predict where Isabel would go-accurately and with time to spare.

Says Vice Admiral Lautenbacher: "I hope everyone at NOAA shares the pride of being part of a team effort that so effectively warned the public of impending danger and enabled citizens to take action to protect themselves and their loved ones."

Well done, indeed.

To learn more about the GOES, see www.oso.noaa.gov/goes/ . For kids, the SciJinks Weather Laboratory at scijinks.nasa.gov has lots of fun activities and fascinating facts about the wild world of weather. This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

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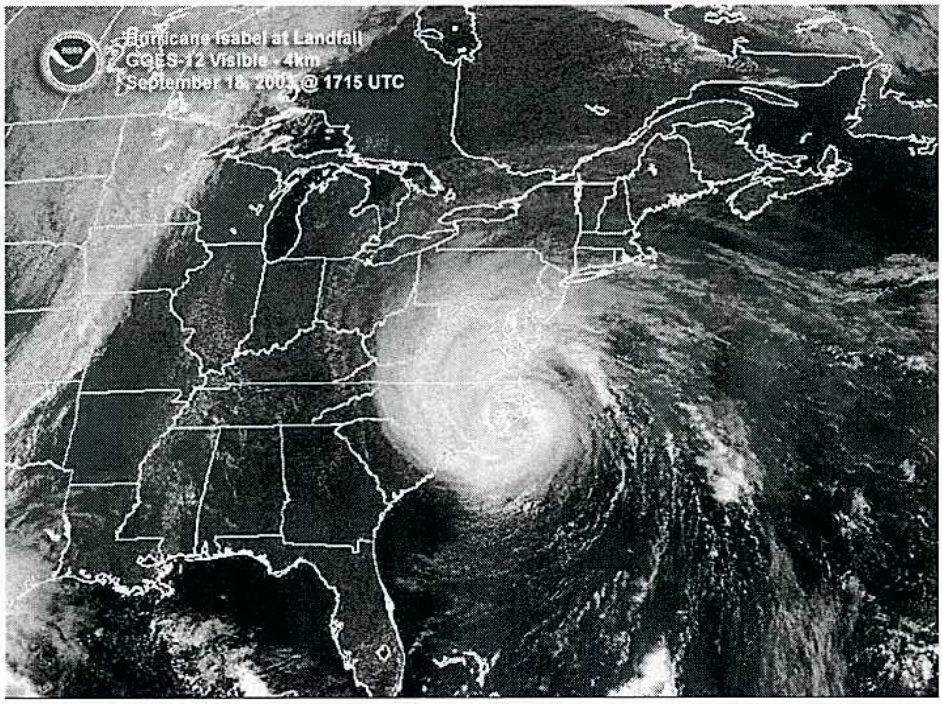


GOES-East satellite image of hurricane Isabel as it makes landfall on September 18, 2003 at 1715 UTC. Image Courtesy: NASA

Sky & Telescope ***sends only one notice before subscriptions end. The DAS sends only one issue of*** **The Denver Observer** ***after dues expire. The cost of magazines*** **(Astronomy** ***and*** **Sky & Telescope)** ***is in addition to the annual dues. For questions concerning memberships, please contact DAS Treasurer, Chuck Carlson (chcarlso@du.edu). See the back page of this newsletter for more information.***

AstroQuiz

(Look for the answer in this issue.)

Q. Who made the first known telescopic drawing of the Moon and who made the first true lunar map?

AstroQuiz is contributed by Sandy Shaw.

Note from the editor:

Thanks to **Patrick Ryan** who has graciously volunteered to take over the editing and production of the *Denver Observer.*

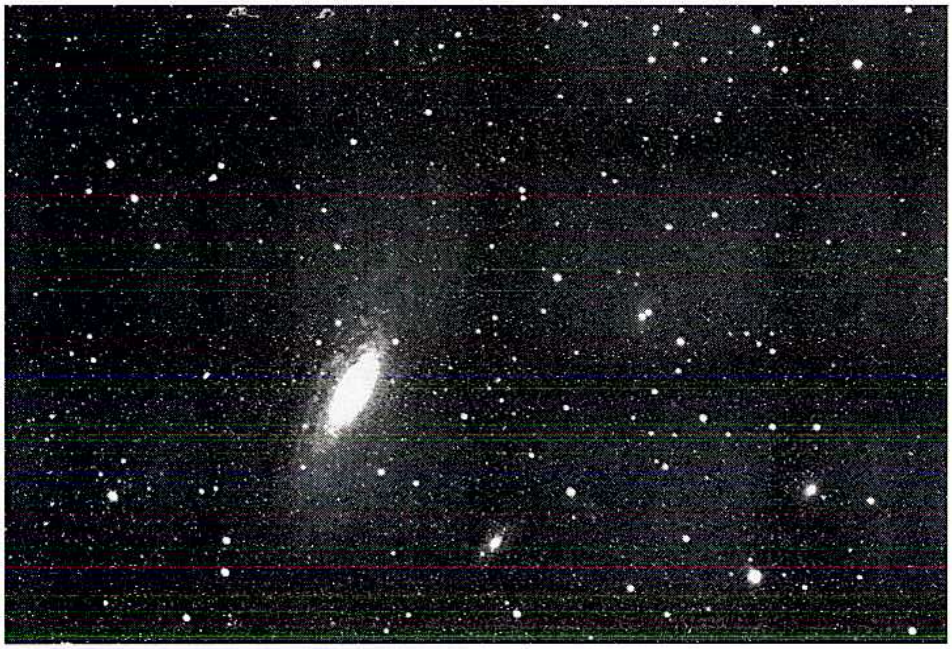
It has been a pleasure to work on the *Observer* each month; as many of you know my work schedule is making it difficult for me to continue to do so. I thank each and every one of the contributors and photographers who have worked so hard over the last few years to help me create this newsletter. I know you will all help Pat as willingly as you helped me. Love and Starlight—*Patti Kurtz*

updates

CCD CORNER

The Right Brew for CCD Imaging

by Steve Solon



Compare the two above images of NGC 7331. The left image depicts a noisy frame, and the right image has been cleaned up using the techniques described in Steve's article.

Noisy world we live in, isn't it? — cars, jets, screaming kids, Harleys (not Ron's.) The conveniences that technology affords us come at an auditory price. They are necessities, to be sure, despite their volume. All noise is not audible, however. Those who digitally image the night sky will attest to this, and gripingly so, particularly if that imaging is done under urban and suburban skies. The light pollution that prevents most film astrophotography under these conditions creates an annoying haze and unwanted bright pixels in CCD images. In this type of imaging, the goal is to gather as many photons of light ("signal") from an object as possible, accounting for the constraints of mount tracking accuracy, polar alignment, etc.

During these exposures, a great deal of static data, or "noise," is also acquired, thanks to bright skies, electronics in the CCD camera itself and any dust, etc. on the optical surfaces of the photographing system. All is not lost, however.

M76

Made with a 12.5-inch f/9 Ritchey Cretien telescope on a Paramount ME, this is is a combination of 10 two-minute images taken on September 27, 2003.

The same technology that permits this wonderfully fast and sensitive imaging also provides a means for cleaning it up — take images of the offensive data and delete it, a process called "image reduction." "Darks," "Flats", "Bias" — new microbrews for the prejudicial? One might think so, but no. These are the terms used to describe the types of noise-reducing images which help to produce breathtaking vistas of the night sky with a CCD camera.

A Dark frame is simply an image taken by the camera of the electronic noise it generates. The frame is taken at the same exposure length and camera temperature as the light frame, then subtracted from it. There are a couple ways of doing this, both easy, but only one that works most efficiently. Most CCD cameras come with an internal shutter for ease in taking darks. If the camera does not have a shutter, capping the telescope and wrapping the camera in a dark towel will do the trick.

The two prominent CCD camera and processing programs, "CCDSoft" by Software Bisque/SBIG and "MaxIm DL-CCD" by Diffraction Limited both include simplified image acquisition properties for all types of frames: Light, Dark, Flat and Bias. For the sake of simplicity, though, we'll use CCDSoft; the operations for MaxIm DL are similar.

To capture as much detail from an object as possible, many light frames should be taken for as long an exposure as possible, then aligned and combined by the software. This yields a tremendous amount of data which can be manipulated in processing.

As with light images, several dark frames should also be taken and median combined by the software, then subtracted from the light frame. An option is to take an "Auto Dark" right after the light image — theoretically, this method should work well to reduce noise. It has been the experience of several imagers, however, that a separate file of darks of the same exposure length and temperature should be taken immediately following the light frames, then combined and applied later in processing. This pro-

duces much more effective noise reduction, time after time.

Flat frames are simply images of the idiosyncracies of the telescope/camera system: dust, dirt, smudges (shame on you,) and any vignetting of the optics. It is important to stress here that the flat frame must be of the system exactly as it was set up for taking the light frame — same focus position, same camera and orientation, same filters (if any used), etc. Camera temperature is not critical, but if flats can be acquired immediately after lights, so much the better.

Several methods for taking flats exist and all produce acceptable results. The first is to stretch a CLEAN T-shirt over the front of the tube and take an image of a dusk sky. The trick here is to capture enough light in the image to charge the CCD from a third to one half its saturation level (this number is listed in the manual of all CCD cameras.) The brightness level can be read by moving the mouse across the acquired image and observing the brightness reading of the pixels at the bottom of the screen.. When the proper level is reached, shoot 5 to 7 images, saving them in their own folder, labelled "NGC7331Lum-flats" for example ("Lum" stands for "Luminance" or light frame.)

A second method is to set up a flat, white illuminated surface in the front of the telescope. Taking an image of this highlights the "unwanteds" you want to remove.

A third method involves shooting a very near-dusk sky without a T-shirt on the scope. This is a little tricky, since you might capture some stars in the process. Finally, there always remains some residual noise, however small, which can contaminate an image.

The Bias frame finalizes the noise removal process and is the easiest to take. The image is taken at the fastest exposure time possible for the camera, a speed known to the operating software because you must tell the software which camera you're using at the onset of a session. This is typically 1/100 of a second, though it can vary with different cameras. As with the flat frames, take several bias and put them in their own folder for later use in processing.

CCDSoft has a reduction feature which allows all acquired reduction frames to be combined and applied to an image in one operation.

On a final note, some folks take a "library" of reduction images to use in processing light frames of different objects. This works moderately well, but only if the light frame sessions follow each other during the same period of a given night. To apply reduction groups to images from different nights is unwise, since temperature, atmospheric dust and light levels and humidity can vary. The safest bet is to carefully take reduction images for a single object, one right after the other, on the same night. This guarantees that all the unwanted data pertinent to your light frame will be removed. The results will dazzle you.—Steve Solon

observers deck

Directions to the E.G. Kline Dark Site

The DAS Edmund G. Kline Dark Site is about 60 miles east of the "mousetrap" in downtown Denver.

Take I-70 east to the Deer Trail exit (exit 328), turn left at the end of the exit ramp, and turn left again on CR 217 (after the Texaco station). Take CR 217 just over 1/2 mile, and turn right (east) onto CR 34. Stay on CR 34 about 6 miles until you get to CR 241. Turn left (north) onto CR 241 and continue about 1.5 miles – you'll see a culvert with a wide gate on the right (east) side of the road.

Directions to the site from Denver, arrival from the North (for after-dark arrivals):

Take I-70 eastbound to exit 316 (Byers). Turn left at end of ramp which puts you on eastbound US-36. Take US-36 east 17.2 miles to CR 241. Turn right (south) onto CR 241 and continue for 6.2 miles. The DSS entrance is on the left between two tall posts.

Note: Travel distance from Denver using the North route is actually 3.9 miles shorter than the traditional route. The first 5 miles of CR 241 going south from US-36 is narrow and somewhat rough. Be careful.

Warming Hut Rules

- The last people on the site must turn off the lights and the heat.
- A microwave will be provided for warming food. Please clean up after yourself.
- No pots and pans, appliances, or other supplies are to be left in the shed.
- No personal supplies are to be left in the shed overnight.
- Do not donate furniture or other things unless you clear it with the D.S.S. committee first.
- No food left overnight in the shed.
- No sleeping overnight in the shed.
- Quick naps are permitted if you feel you might fall asleep on the way home. We would prefer you get your nap rather than falling asleep on the road. However, we don't want it to become a tent for camping.
- Clean up after yourself before you leave the site.
- Please clean up all food that drops or is spilled, otherwise it will attract mice and insects.

M27—The Dumbell Nebula in Vulpecula, is a beautiful example of a planetary nebula. Taken at this year's Okie Tex star party, Joe Gafford used his 18-inch f/4.5 telescope with an SBIG ST200SM CCD camera. Each RGB exposure was 10 minutes with no luminance exposures.

Dark Sky Site Courtesy

Please remember that white light disrupts the eye's dark adaptation and can ruin astrophotography. Following these simple guidelines will improve the experience for all:

★ Upon arrival at the site, check to see if sign in has been instituted at the warming hut. We hope this will help alleviate problems members may be experiencing in trying to find a place to set up.

★ Drive carefully on the road, there are blind spots in the low area and you will find cattle on the road at times.

★ Try to arrive before dark.

★ If you have to arrive after dark, turn off headlights when turning into site.

★ Turn off all dome and trunk lights. If a light can't be turned off, pull the fuse, use layered red brake light tape or just duct tape over it.

★ When you drive in, position your car so you can drive out directly instead of using your back up lights.

★ Use only dim red flashlights. Never shine a flashlight in someone's face or on their scope.

★ Please wipe your feet carefully before using the warming hut.

★ Please chip in and do some cleaning up in the hut or at the observing sites. It is the responsibility of all users to keep the place nice.

★ Serious astrophotographers may wish to use the South field since it is somewhat isolated from the rest of the area.

★ If you are the last person to leave the site, turn off the lights and the heaters in the warming hut. Then, lock the warming hut and close the gate to the site.

★ Members are responsible for educating their guests as to the rules.

★ Prospective members, out of town astronomers, and others may be guests one time.

★ Members can bring family any time and personal friends on a limited basis, but should not abuse the privilege.

★ Groups of five or more guests must be cleared through the President or Vice President prior to visiting the Dark Sky Site.

★ There is no sleeping in the warming shed overnight. However if you need to nap for a short period, you can use the shed. We would rather you fall asleep there rather than at the wheel on the way home.

★ You may warm drinks in the microwave—it is not there for warming food and cooking since we have no water to clean up. If you spill, please clean up after yourself

Other Suggestions:

★ Wear warm clothing. The nights can be extremely cold in the winter and surprisingly cold in the summer.

★ Bring your own power such as a battery and/or an inverter since the power sites are limited. Also bring extension chords.

★ Hot drinks can help you survive the night!

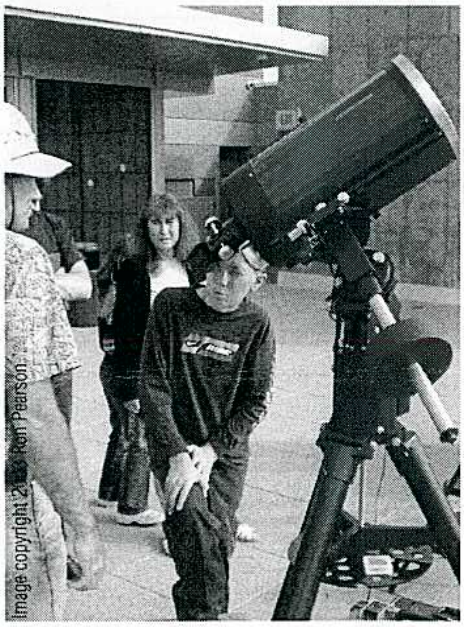
★ When approaching the telescope of someone who does not know you, introduce yourself and ask before looking through the scope. Most members (with the exception of astrophotographers when they are taking pictures) will be happy to share their scopes.

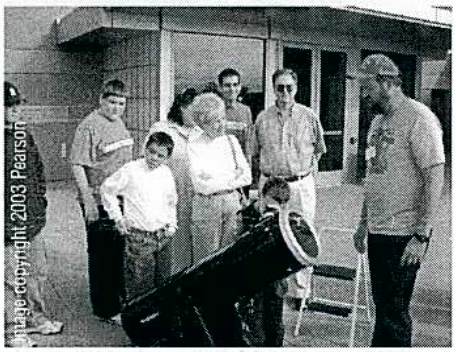
★ Bring your own toilet paper in case that in the porta-potty runs out.

edmund g. kline dark site

Colorado Astronomy Day in Pictures

Gear up for chilly nights — here's a good target for winter observers. M78 taken from Grand Lake, CO on December 09, 2002 with a 12-inch LX200 at f/5, and an SBIG 10XME LRGB 60, 15, 22, 22. Image copyright 2003 Chris Tarr





Astronomy Day in Pictures
Counterclockwise from left to right: Larry Brooks shows up for the activities and greets members Ron and Neil Pearson who worked the DAS booth. A young boy looks at the sun through Darrell Dodge's telescope. Todd Hitch shows off the sun from the DMNS Sky Terrace, and Carla Swartz with Norm Rosling. Norm won the "Eyes on the Skies Raffle 2003" for the Meade ETX-90 telescope.

Annual Holiday Potluck Saturday, December 6th at 5 p.m.

Cook up your favorite dish and join us for lots of holiday cheer at Chamberlin Observatory. The Holiday Potluck party will take place of the monthly general meeting. If you have some slides of your travels over the past year or great astro photos you would like to share, please bring them along.

Astro-Quiz Answer

A. British mathematician Thomas Harriot made the first known telescopic drawing of the Moon on July 26, 1609, preceding Galileo by only four months. Using a 6-power instrument, Harriot sketched a five-day old Moon. The first true lunar map came to be in response to the quest to determine terrestrial longitudes. Michael Florent Van Langren, member of a Flemish globe and map-making family, believed that the Moonís rotation could be used as a celestial clock. By timing moments of sunrise or sunset on various lunar features in local time and using an ephemeris that listed the same events in standard time, longitude could be determined immediately. Van Langrenís map, published in March 1645, included surface shadings as seen at full Moon, topographic features, and a nomenclature scheme. The only one of Van Langrenís lunar names that survives today is a crater honoring him -Langrenus, just east of Mare Fecunditatis. A crater on the far side of the moon is named for Harriot.—*Sandy Shaw*

members go public

About the Denver Astronomical Society

The DAS is a group of amateur and professional astronomers that share a mutual interest in the heavens. The DAS operates the University of Denver's Chamberlin Observatory, along with its prized 1894 Alvan Clark 20-inch refracting telescope. Our members have been involved with the first public planetarium at the Denver Museum of Science and Nature and the Smithsonian Astrophysics Observatory's "Moon Watch" program. The DAS successfully petitioned to have the Chamberlin Observatory listed on the National Register of Historic Places.

Our Credo is to provide members a forum for increasing and sharing their knowledge, to promote and educate the public about astronomy, and to preserve the historic telescope and observatory in cooperation with the University of Denver. To these ends we have established three tax deductible funds: the Van Nattan Scholarship Fund, the Chamberlin Restoration Fund, and the DAS Dark Sky Site Fund. This last fund was established in order to construct and maintain observing facilities near Deer Trail in eastern Colorado.

Please call our Info Line at (303) 871-5172 and drop by the General Membership meetings. Become a member and enjoy speakers, facilities, events, and our monthly newsletter, *The Denver Observer.*

Application for Membership to the Denver Astronomical Society

New ☐ Renewal ☐

Name: _____

Address: _____

City, State, Zip: _____

Phone numbers: Home ( ) Work ( )

E-mail Address: _____

Occupation: _____

Other Interests: _____

(Associates Only) School: _____ Grade: _____

Do you want to download the newsletter in PDF format from our website instead of by postal mail?

Yes ☐ No ☐

Do you want the above information excluded from the yearly roster?

Yes ☐ No ☐

Please Circle All That Apply:

Regular Membership: $30 Associate: $10 *(Age 22 and younger)* ..... $ _____

Astronomy Magazine/$29

Sky & Telescope Magazine/$32.95

..... $ _____

Van Nattan Scholarship Fund ..... $ _____

Chamberlin Restoration Fund ..... $ _____

Total Amount Paid ..... $ _____

Please mail Dark Sky Site donations to: DAS Treasurer, Chuck Carlson, at the address below. (Make checks payable to the Dark Sky Site Fund).

Please complete this form, or a copy, and mail it with your check or money order payable to The Denver Astronomical Society:

DAS Treasurer, Chuck Carlson; 1521 So. Vine St.; Denver, CO 80210

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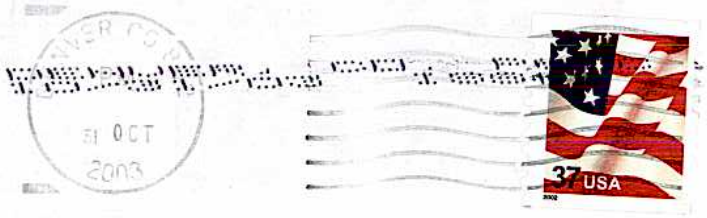
c/o Chamberlin Observatory
2930 East Warren Avenue
Denver, Colorado 80208



November's Meeting
November 14:

General Meeting at Olin Hall, DU, 7:30 P.M.—"Members Show and Tell Night." Bring your astronomically-related goodies to share with your fellow DASers.

Membership Expires 1/1/2005
Bradley D Gilman
4801 S Acoma, #55
Englewood CO 80110-6547

join us